

REMARKS

Claims 5, 6, 12, 14-16, 18-20, 58, 61-63, and 86 to 92 are presently pending, of which claims 12 and 58 are being amended, and claims 86 to 92 are being added.

The amendments to claims 12 and 58, and added claims 86 and 92 are supported in the Specification at page 12, lines 6-15, which states:

".... The percentage of each of C, H, Si and O atom in the nanocomposite can be selected to provide the desired composition characteristics. A suitable diamond-like nanocomposite may comprise a composition of, for example, from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon and from about 5 atom % to about 10 atom % oxygen. The diamond-like nanocomposites may comprise a low coefficient of friction of less than about 0.3, such as from about 0.05 to about 0.2, and a low average surface roughness of less than about 0.4 micrometers, such as from about 0.05 micrometers to about 0.4 micrometers, and even less than about 0.1 micrometers. The diamond-like nanocomposite may also comprise a microhardness of at least about 8 GPa, such as from about 8 to about 18 GPa. The diamond-like nanocomposite may also comprise a high purity, for example, the diamond-like nanocomposite can comprise less than about 5×10^{12} atoms/cm² and even less than about 5×10^{11} atoms/cm² of metal impurities. For example, the material can comprise less than about 10 atom % of metal impurities such as titanium, and even less than about 7 atom % of titanium."

New claim 86 is further supported by original claim 1, and the Specification at, for example, page 4, line 9, which states "[t]he mesas have a coating of a diamond-like material over a titanium layer." New claims 86-92 are further supported by the original claims.

Thus the claim amendments and added claims add no new matter and are fully supported by the Specification and claims as originally filed.

Reconsideration of the present case in view of the above amendments and the remarks herein is requested.

Allegedly Insufficient Declarations

The Examiner's alleges that the 37 C.F.R. 1.132 declarations submitted by Applicant on 20 December 2006 are insufficient to overcome the 35 U.S.C. §102(e) rejections based on U.S. Patent Application 2004/0055709 to Boyd et al.

Applicant reserves the right to traverse the Examiner's conclusions and/or to provide additional evidence in support of this Declaration or other new Declarations. However, Applicant is withdrawing the previously presented Declaration at this time, as it is believed to be moot in view of the amendments and remarks made herein.

Rejection under 35 USC § 112

Claim 58 and 61-63 were rejected under 35 USC § 112, first paragraph, because the specification does not reasonably provide enablement for "an adhesion layer consisting of metal".

In order to satisfy the enablement requirement, the Specification must contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Applicant is amending claim 58 to recite that "... an adhesion layer comprising a metal layer." This language is supported by the Specification at page 18, lines 9-12, which recites:

....For example the adhesion layer 140 can comprise at least one of titanium, aluminum, zirconium and chromium. In one version, the adhesion layer 140 comprises a metal such as titanium that bonds well to both metal and non-metallic materials.

[Emphasis added.]

Applicant is making this amendment for the sake of obtaining allowance without further prosecution as this case has already been extensively prosecuted and Applicant is somewhat frustrated with the lack of progress thus far.

However, Applicant strongly disagrees with the Examiner that the present Specification is not enabling for "an adhesion layer consisting of metal". The Specification explicitly teaches "... the adhesion layer 140 comprises a metal such as titanium" in section quoted above. One of ordinary skill in the art would understand this sentence to mean that the adhesion layer comprises a pure or elemental metal, one example of which is the metal - titanium. Therefore this sentence expressly describes an adhesion layer "consisting of" or purely made of the metal titanium. Still further the Specification also teaches other metals at page 18, lines 9-15: "... the adhesion layer 140 can comprise at least one of titanium, aluminum, zirconium and chromium." Thus, the Specification clearly enables "an adhesion layer consisting of metal" as recited in claim 58.

Still further the Specification expressly describes a "titanium layer", such as at page 4, line 9: "The mesas have a coating of a diamond-like material over a titanium layer." One of ordinary skill in the art would not confuse such an explicitly described "titanium layer" to mean a layer of titanium oxide or other compounds of titanium as suggested by the Examiner. In fact, even an average person of less than ordinary skill in the art would understand the meaning of "a titanium layer" or "a metal such as titanium." When such a hypothetical average person goes to a Hardware store and asks for a "copper pipe" or a "steel plate", the storekeeper immediately understands the average person of less than ordinary skill in the art, to mean a pipe of elemental copper metal, and not a pipe made of copper nitride or copper oxide. Does the Examiner expect the average person to ask for a "pipe consisting of elemental copper in the metallic form with free electrons in its outermost orbit" to get a copper pipe at a hardware store? Thus the meaning of "a titanium layer" or "a metal layer such as titanium" is explicitly to a layer made of elemental metal such as titanium metal, and

thus, this language expressly supports the claim language to "an adhesion layer consisting of metal".

Claim rejections under 35 USC § 102

I. Claims 12, 14, 17 and 19 were rejected under 35 USC §102(e) as being anticipated by U.S. Patent Application 2004/0055709 to Boyd et al. (hereinafter Boyd et al.). The rejection is traversed.

In order to anticipate a reference, each and every element of the claim must be disclosed by a single prior art reference. W.L. Gore & Assocs. V. Garlock, Inc., (Fed Cir. 1983), cert. denied, 469 U.S. 851 (1984). Non-disclosure of a single element, feature or limitation of the claim negates anticipation.

Boyd et al. does not anticipate independent claim 12 because Boyd et al. does not teach each and every element of claim 12. As amended, claim 12 is to a substrate support comprising, inter alia, a contact surface comprising a plurality of mesas, the mesas comprising a coating of a diamond-like carbon material directly over a titanium metal adhesion layer, the diamond-like carbon material comprising a composition of from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon, and from about 5 atom % to about 10 atom % oxygen, to provide a coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a microhardness of at least about 8 GPa, whereby the diamond-like coating reduces the abrasion and contamination of substrates that contact the coating.

Boyd et al. does not disclose mesas having a distinct titanium metal adhesion layer. The Examiner cites paragraph 2 of Boyd et al. for teachings to a "titanium metal adhesion layer". However, the disclosure of titanium by Boyd et al. is to a metal oxide dopant in the alumina body of the substrate support. Specifically, paragraphs 2 reads:

"The chuck body is typically formed from aluminum nitride, alumina doped with metal oxide

such as titanium oxide (TiO₂), or other ceramic material with similar mechanical and resistive properties..."

Furthermore, nowhere does Boyd et al. teach a coating of "titanium metal" on a chuck body. For example, Boyd et al. teaches coatings in paragraph 2, namely that the chuck body:

"... may be coated with polyimide, alumina, aluminum-nitride, and similar dielectric materials."

Coatings of polyimide, alumina, aluminum-nitride and "similar dielectric materials" as taught by Boyd et al. are all coatings of dielectric materials - not elemental metal coatings.

Furthermore, claim 12 expressly recites "titanium metal adhesion layer" to mean an adhesion layer made of titanium metal. Boyd does not teach a titanium metal layer let alone an elemental metal coating for the chuck. Instead, Boyd teaches dielectric materials or alumina and aluminum nitride which are both ceramics, or polyimide which is a polymer, and none of which is even in the same class of materials as elemental metals such as titanium.

In fact dictionary definitions of a metal, such as "titanium metal" as claimed, define materials which do not fall in the class of "dielectric materials". Wikipedia defines a metal to be:

A metal is a chemical element that is a good conductor of both electricity and heat and forms cations and ionic bonds with non-metals. In chemistry, a metal (Ancient Greek μέταλλον, μέταλλον) is an element, compound, or alloy characterized by high electrical conductivity. In a metal, atoms readily lose electrons to form positive ions (cations). Those ions are surrounded by delocalized electrons, which are responsible for the conductivity. The solid thus produced is held by electrostatic interactions between the ions and the electron cloud, which are called metallic bonds.

Metals have entirely different material properties, such as different mechanical, electrical and resistive properties, which are distinct from the dielectric material coatings taught by Boyd et al.

Further the claimed “titanium metal” is a particular metal, and Boyd does not expressly disclose a titanium metal coating anywhere in its Specification.

By failing to teach the titanium metal adhesion layer, Boyd et al. therefore does not disclose each and every element of claim 12 and thus does not anticipate claim 12.

Other elements of claim 12 are also not disclosed by Boyd et al., such as mesas having a separate adhesion layer, and a diamond-like carbon coating as claimed, which has a composition of 50-90% carbon, 5-10% hydrogen, 10-20% silicon and 5-10% oxygen, a coefficient of friction of less than about 0.3 and a hardness of at least about 8 GPa. However, arguments on these points are omitted in favor of expediency.

For these reasons, Applicant requests withdrawal of the rejection of claim 12 under 35 U.S.C. §102(e). In addition, Applicant requests withdrawal of the rejection of claims 14, 17 and 19 which depend from claim 12 and are not anticipated by Boyd et al. for at least the same reasons as claim 12.

Claim rejections under 35 USC §103(a)

I. **The Examiner rejected claims 12, 14, 15, 19 and 58 under 35 USC §103(a) as being unpatentable over Anderson et al. (U.S. Patent 5,583,736) in view of Larsen (U.S. Patent 5,969,934) and Massler et al. (U.S. Patent 7,160,616).**

“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” KSR Int'l Co. v. Teleflex, Inc., 127 S. Ct. at 1741. Instead, in order to determine whether an invention would have been obvious, it is useful to identify some “apparent reason to combine the known elements,” either by looking to the teachings of the prior art, the knowledge of one with ordinary skill in the art, or demands present in the marketplace. Id. 127 S. Ct. at 1740. “[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the

elements in the way the claimed new invention does." Id. at 1741.

Anderson et al., Larsen and Massler et al. do not render independent claim 12 unpatentable because none of Anderson et al., Larsen or Massler et al. teach or suggest claim 12, and there is no reason to combine what is taught to derive claim 12, which is to: a substrate support comprising a ceramic structure having an electrode embedded therein (the electrode being chargeable to electrostatically hold a substrate) and a contact surface comprising a plurality of mesas, the mesas comprising a coating of a diamond-like carbon material directly over a titanium metal adhesion layer, the diamond-like carbon material comprising a composition of from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon, and from about 5 atom % to about 10 atom % oxygen, to provide a coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a microhardness of at least about 8 GPa, whereby the diamond-like coating reduces the abrasion and contamination of substrates that contact the coating.

Anderson et al. does not teach or suggest the claimed features of claim 12. First, Anderson et al. fails to teach an electrostatic substrate support structure constructed as a ceramic comprising an electrode embedded therein, as claimed in claim 12. The Examiner cites Col. 6, lines 8-26 for teachings to different arrangements, but the cited passage is directed to attachment means for bonding a silicon plate onto a chuck face and does not teach other arrangements, nor the claimed arrangement of an electrode embedded in a ceramic support structure. The claimed ceramic structure with an embedded electrode forms the basis of the present claim.

Anderson et al. also does not teach or suggest an electrostatic chuck comprising a coating of a diamond-like carbon material. Instead, Anderson teaches a chuck including a micromachined silicon wafer with silicon-dioxide islands thereon and which can optionally be coated with silicon nitride. Silicon-dioxide and silicon nitride are not the same as and do not have the same material properties as diamond-like carbon. As

stated in the present Specification, the diamond-like carbon coating material provides numerous benefits including but not limited to reduced abrasion and contamination of substrates that contact the coating.

Still further, Anderson et al. also fails to teach a diamond-like carbon material directly over a titanium metal adhesion layer, as recited in claim 12. There is no metal adhesion layer in Anderson et al., and the only layer apparent between a ceramic support structure (silicon wafer) and a surface coating (silicon nitride layer) is the silicon dioxide mesas themselves. Teachings to an intermediary layer of silicon dioxide is not a teaching to a metal adhesion layer because silicon dioxide is a ceramic and not a metal, and hence has very different material characteristics from a metal layer. One of ordinary skill in the art would not substitute a metal adhesion layer for the insulative silicon dioxide mesas, because the silicon dioxide is provided to prevent electrical contact between the substrate and the underlying silicon support (Anderson et al., Col. 4 lines 6-10). Further, replacing the silicon dioxide mesas with a metal adhesion layer may even render the chuck of Anderson et al. inoperable. Even on such substitution, the chuck of Anderson still would not have a diamond-like carbon material layer.

Thus, Anderson et al. fails to teach almost all of claim 1 because it fails to teach the ceramic structure having an embedded electrode, fails to teach a coating of diamond-like carbon material, and still further fails to teach a titanium metal adhesion layer below the diamond-like carbon material.

Larsen and Massler et al. do not make up for the deficiencies of Anderson et al., and the proposed combination of references is improper under 35 §103(a) and does not render claim 12 unpatentable.

First, Larsen fails to teach a substrate support comprising mesas. Instead, the substrate support of Larson is a planar support having bevelled periphery. The coating of Larson further provides a reduction in the texture of the planar surface, by providing an "... increase in radius of surface features (which) produces an effectively higher

negative rake angle between such features and the wafer, thus requiring more energy to break off a feature and create a particle." (Larsen Col. 7, lines 40-50) Teachings to a planar surface and reduction of surface features are not a teaching or suggestion to a substrate support comprising mesas. Further, one of ordinary skill in the art would not substitute the smaller contact surface of mesas in place of the larger, planar support surface of Larsen because such substitution, based on the teachings of Larsen, is expected to decrease the energy required to break off a feature and create a particle.

Larsen also fails to teach a diamond-like carbon material directly over a titanium metal adhesion layer, as recited in Applicant's claim 12. Instead, the amorphous carbon layer of Larsen is deposited in conformal contact with the chuck surface. Mesas comprising a diamond-like carbon material directly over a titanium metal adhesion layer provide better adhesion of the diamond-like carbon material to the underlying ceramic structure. At the same time, the contamination reducing and wear reducing properties of the diamond-like carbon material is not compromised as the adhesion layer lies below the coating of the diamond-like carbon material. This combination of layers achieves a unique benefit that is simply not taught or suggested by either Larsen or Anderson et al.

Larsen further does not teach or suggest any coefficient of friction or hardness of the diamond-like material. The coating of the present component comprises a diamond-like carbon material directly over a titanium metal adhesion layer, the diamond-like carbon material comprising a composition of from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon, and from about 5 atom % to about 10 atom % oxygen, to provide a coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a microhardness of at least about 8 GPa, whereby the diamond-like coating reduces the abrasion and contamination of substrates that contact the coating.

There is a direct nexus between the claimed diamond-like coating composition and the resultant frictional, surface roughness, and microhardness material characteristics which render this coating entirely non-obvious over the art. In fact, these properties arise directly from the carefully selected and modified composition of the diamond-like coating, namely an atomic percent composition of from about 50 to about 90% carbon, from about 5 to about % hydrogen, from about 10 to about 20% silicon, and from about 5 to about 10% oxygen. Larsen is silent regarding the composition of its amorphous diamond layer. As taught by the present Specification, the composition of the diamond-like coating is important because it affects the sp₂ and sp₃ bonding characteristics of the diamond-like material, which in turn provide desirable properties, such as the claimed frictional, surface roughness, and hardness properties. It is not intuitive or obvious to modify the properties of a diamond like carbon layer, which can have the same hardness as diamond –the hardest know material – to reduce its surface roughness to levels which do not excessively wear out and create contaminant particles from a silicon wafer when such a coating is applied to the contact surface of an electrostatic chuck.

In fact, the nexus between the composition of the diamond-like coating and the resultant frictional, microhardness and surface roughness properties, is expressly taught in the Specification:

In another version, the contamination reducing coating can comprise a diamond-like material comprising a diamond-like nanocomposite having both (i) networks of carbon and hydrogen, and (ii) networks of silicon and oxygen. The diamond-like nanocomposite is similar to the diamond like carbon, in that it comprises a network of bonded carbon atoms of which a substantial fraction are sp³ hybridized but does not have a substantially long-range order as in pure diamond, and can further comprise bonded hydrogen atoms. Depending on the fabrication conditions, the diamond-like nanocomposite can be fully amorphous or can contain diamond crystallites, for example, at the nanoscale level. The diamond-like nanocomposite comprises a networks of silicon bonded oxygen that interpenetrate the carbon networks in a substantially random fashion, to form a composite material having high temperature stability, high hardness and a low coefficient of friction. The percentage of each of C, H, Si and O atom in the

nanocomposite can be selected to provide the desired composition characteristics. A suitable diamond-like nanocomposite may comprise a composition of, for example, from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon and from about 5 atom % to about 10 atom % oxygen. The diamond-like nanocomposites may comprise a low coefficient of friction of less than about 0.3, such as from about 0.05 to about 0.2, and a low average surface roughness of less than about 0.4 micrometers, such as from about 0.05 micrometers to about 0.4 micrometers, and even less than about 0.1 micrometers. The diamond-like nanocomposite may also comprise a microhardness of at least about 8 GPa, such as from about 8 to about 18 GPa. The diamond-like nanocomposite may also comprise a high purity, for example, the diamond-like nanocomposite can comprise less than about 5×10^{12} atoms/cm² and even less than about 5×10^{11} atoms/cm² of metal impurities. For example, the material can comprise less than about 10 atom % of metal impurities such as titanium, and even less than about 7 atom % of titanium.

(Specification, page 11, line 29 to page 12, line 19.)

The claimed composition of the DLC coating and its desirable material characteristics, and the benefits derived from such a coating of reduced substrate wear and thus reduced contaminant particles, are not taught or suggested anywhere by Larsen. For example, the Specification teaches:

In one version, the contamination reducing coating comprises a material having a coefficient of friction that is sufficiently low to reduce the formation and deposition of friction or abrasion resulting particulates on the substrate 104. The low-friction material can improve substrate processing yields by contacting the substrate 104 only with a low-friction material that is less likely to flake or "rub-off" the surface 22 and deposit onto the substrate 104. The low-friction material suitable for the surface 22 desirably comprises a coefficient of friction of less than about 0.3, such as from about 0.05 to about 0.2. The coefficient of friction is the ratio of the limiting frictional force to the normal contact force when moving the surface 22 relative to another surface. By comparison, a supporting surface of a heating pedestal 151 made of stainless steel, and without the aforementioned coating, can have a coefficient of friction of at least about 0.7. The contamination reducing coating further comprises a low average surface roughness, such as for example, an average surface roughness of less than about 0.4 micrometers.

The lower surface roughness makes the contact surface 22 of the coating less likely to catch or tear out the substrate 104 when the substrate is transferred onto or off the contact surface 22.

The contamination reducing coating also desirably has a high hardness to provide better resistance to scratching and abrasion by the substrate 104. When the substrate is a relatively hard material, it is desirable for the contact surface 22 to also be composed of a material having a relatively high hardness to be less likely to generate loose particles or flakes due to scratching of the surface 22. A suitable contamination reducing coating may comprise a hardness of at least about 8 GPa, such as from about 8 Gpa to about 25 Gpa, and even at least about 10 GPa, such as from about 18 Gpa to about 25 GPa. The surface 22 desirably comprises a hardness that is selected with respect to the substrate 104 being processed. For example, the surface 22 of a component for processing a substrate 104 comprising a semiconductor wafer may have a hardness that is different than the hardness of a surface 22 for processing a substrate 104 comprising a dielectric glass panel used for displays.

(Specification, page 8, lines 8 to 36.) Thus, Larsen is further deficient because Larsen does not teach the claimed composition of the DLC coating and its desirable characteristics, and the benefits derived from such a coating of reduced substrate wear and thus reduced contaminant particles.

To make up for the deficiencies of Anderson et al. and Larsen, the Office Action relies on Massler et al.'s general teaching of a multi-layer diamond-like system. However, Massler et al. fails to teach or suggest application of the multi-layer diamond-like system to a substrate support comprising "a ceramic structure having an electrode embedded therein, the electrode being chargeable to electrostatically hold a substrate" as claimed in claim 12. Instead, Massler et al. is directed to coatings for heavy machinery parts and cold working / die casting components, specifically:

"... mention may here be made not only of applications in connection with machine construction, among them protection against sliding wear, pitting, cold bonding, etc., especially machine parts that move with respect to each other, such as, for example, gear wheels, pump and moulding die (cup) rams, piston rings, injection needles, complete bearings or their individual components, and various others, but also

applications in the material processing sector for the protection of the tools employed for chipping or cold working and in die casting."

Massler et al's teachings to engine parts and tools for chipping, cold working and die casting do not teach or suggest a substrate support comprising a ceramic structure having an electrode embedded therein, the electrode being chargeable to electrostatically hold a substrate. The substrate support with embedded electrode capable of electrostatically holding a substrate necessarily has different mechanical and electrical requirements from an engine part in a modern automobile, and there is no reason to expect that the surface coating of an engine part would be appropriate for use on a substrate support for electrostatically holding semiconductor wafers.

Massler et al. also does not teach or suggest an electrostatic chuck comprising mesas comprising a diamond-like carbon material directly over a titanium metal adhesion layer. By "directly over" it is meant that there is no intervening layer between the two layers. Instead, Massler et al. teaches a multilayer DLC layer system comprising an adhesion and a transition layer that includes both metal and carbon in a gradient. The absence of an element of a taught combination of elements further negates an obviousness rejection. Specifically, Massler et al. teaches:

Layer System

A DLC layer system in accordance with the invention is obtained by the production of a layer with the following layer structure.

An adhesion layer with at least one element from the group of elements of subgroups IV, V and VI and silicon is situated directly on the substrate. Preference is accorded to an adhesion layer of the elements chromium or titanium, which have proved particularly suitable for this purpose.

This is followed by a transition layer that is preferably formed as a gradient layer, in which the metal content diminishes in the direction at right angles to the substrate surface, while the carbon content increases.

The transition layer comprises essentially carbon and at least one element of the group of elements that constitute the adhesion layer. In a preferred embodiment it may also contain hydrogen. Over and above this, both the transition layer and the adhesion layer contain inevitable impurities constituted by, for example, atoms incorporated into

the layer from the surrounding atmosphere, for example, atoms of such inert gases as argon or xenon used in the process. ...

The end of the layer package is constituted by a layer that consists essentially exclusively of carbon and preferably hydrogen and, as compared with the adhesion layer and the transition layer, also has a greater thickness. In addition to carbon and hydrogen, this layer may once again contain inert gases like argon or xenon. But in this case it is altogether essential that there should be no additional metallic elements or silicon.

[Column 4, line 21 – column 5, line 3.] The multilayer DLC layer system comprising transition layers having a gradient of carbon, and still other layers consisting exclusively of carbon and preferably hydrogen, does not teach or suggest a diamond-like carbon material directly over a titanium metal adhesion layer. Massler et al. teaches the necessity of having complex intervening layers between the DLC layer and the underlying structure, which does not teach or suggest the present claims.

Further, Massler et al. does not teach or suggest a component having an contact or exposed surface with a particular set of properties, such as the coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a hardness of at least about 8 GPa. Although Massler et al. teaches a diamond-like carbon layer, the exposed surface of Massler et al. is a graphitic carbon surface. Specifically, as taught by Massler et al.:

"... DLC layer systems deposited in accordance with the invention ... do not reach the exceptionally small friction coefficients that can be realized with metal/carbon layers and are not suitable for running-in layers."

(Massler et al., col. 6, lines 21-25) Masler et al. further states:

"... it is recommended to terminate the system by applying also a softer slipping layer containing a relatively large proportion of graphitic carbon."

(Massler et al., col. 6, lines 27-30) Graphite is a soft material, having a hardness somewhere between 1 and 2 GPa – significantly less than the claimed surface which has a hardness of at least 8 GPa. One of ordinary skill in the art would not have any reason to omit the graphitic carbon contact surface of Massler et al., as Massler et al. teaches that the DLC layer by itself performs poorly. Also, one would not need to

modify the surface roughness of the DLC coating, if one were to use a softer graphite overlayer as suggested by Masler et al. Thus Masler clearly does not allow derivation of Applicant's claimed DLC coating with a controlled surface roughness, frictional properties, and microhardness.

Finally, Massler et al. does not teach or suggest the nexus between a diamond-like carbon coating having a composition of from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon, and from about 5 atom % to about 10 atom % oxygen, and the resultant properties of a coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a microhardness of at least about 8 GPa, whereby the diamond-like coating reduces the abrasion and contamination of substrates that contact the coating, as claimed in claim 12.

Massler et al. is silent regarding the composition of its diamond-like carbon layer or the benefits of this composition as explained above in the arguments against Larsen. As taught by the present specification, the composition of the diamond-like coating is important because it provides the desired friction and hardness characteristics, and affects the sp₂ and sp₃ bonding characteristics of the diamond-like material. The claimed component comprises an embedded electrode and is capable of electrostatically contacting and holding a substrate, thus the frictional properties of the coating material are important. Such material characteristics, and the benefits derived therefrom, are not taught or suggested by Larsen. Indeed, there is no reason for Larsen to be concerned with the frictional and hardness and surface roughness properties in combination with the electrical properties of the coated engine part because such structure does not have the same requirements as a coating on a electrostatic chuch used in the semiconductor field. The graphitic surface layer taught by Larsen is further taught to be deposited under a longitudinal magnetic field, which would result in long graphite particles aligned in the direction of the longitudinal field, and the resultant surface layer can be expected to have a resistivity that is anisotropic, or varies depending on the direction of measurement – these are desirable properties for a

coating for an electrostatic chuck. One of ordinary skill in the art would be further dissuaded from use of the multi-layer coating of Massler et al. because there is little or no expectation that the layers of Massler et al., which are taught to be deposited under a longitudinal magnetic field, would have suitable anisotropic electrical properties sufficient for use as a coating on an electrostatic substrate support, or wear and frictional properties suitable for substrates in the semiconductor field.

The Examiner fails to provide compelling reasoning as to why one of ordinary skill in the art would have been motivated to (1) replace the silicon nitride coating of Anderson et al. with a diamond-like coating taught by Larsen, and (2) then replace the Larsen coating with selective portions of the multilayer coating of Massler et al. One of ordinary skill in the art would also have no apparent reason to substitute parts of the multilayer coating of Massler et al. with the claimed simpler structure of a diamond-like carbon material which is directly over a titanium metal adhesion layer. One of ordinary skill in the art would not have found it obvious to replace Anderson's coating with another coating (Larsen's) and then replace that coating with another coating, and further modify and eliminate elements from the last coating substitution. Accordingly, this multiple step modification proposed by the Examiner does not constitute a proper rejection under 35 U.S.C. §103(a).

In actuality, it would not have been obvious to one of ordinary skill in the art at the time of Applicant's invention to replace Anderson et al.'s coating with a partial combination of the coatings taught by Larsen and Massler et al. First, the Examiner has provided no reason as to why one of ordinary skill in the art would have been motivated to replace Anderson et al.'s silicon nitride coating in the first place. According to Anderson et al., the resulting support "is tough and wear resistant, and particulates less than 2-3 micrometers are unlikely to abrade the chuck or lower the clamping force" (column 3 lines 24-27). Thus, after considering the teaching of Anderson et al. as a whole, one of ordinary skill in the art would not have been motivated to modify Anderson et al. by removing the coating described by the reference as being fully functional.

Furthermore, one of ordinary skill in the art would have been taught away from making the Examiner's proposed modification. For example, Anderson et al. teaches the desirability of fabrication by simple and inexpensive processing techniques (see column 3 lines 20-22). In contrast, Massler et al. describes a complex and elaborate multi-step fabrication process for applying the taught multilayer coating system (see column 8 line 27 through column 13 line 54). Accordingly, one of ordinary skill in the art -- after considering the teachings of Anderson et al. -- would be steered away from a more complex coating process, particularly in view of the described adequacy of coating taught by Anderson et al.

In addition, one of ordinary skill in the art would not have found it obvious to replace the coating of Massler et al. with the coating of Anderson et al. for other reasons. For example, Anderson et al.'s coating is described as being a thin layer from 3000-6000 Angstroms. The multilayer coating of Massler et al. is significantly thicker (see column 5 lines 16-21). Note that even the lower range of the desired coating thickness in Massler et al. is twice the thickness of Anderson et al.'s coating. Further, most of the coating thicknesses in Massler et al. are thicker than the height of the mesas taught by Anderson et al. Thus, by applying the coating of Massler et al. to the mesas of Anderson et al., the mesas would effectively be leveled out. Also, Anderson et al. describes the use of silicon nitride coating to prevent shorting (see column 5 lines 2-5). Thus, one of ordinary skill in the art would not have found it obvious to replace the silicon nitride coating with the Massler et al. coating that includes metals and other materials that might make it less effective than the silicon nitride in preventing shorting.

For at least these reasons, claim 12 is not properly rejectable under 35 USC §103(a) as being unpatentable over Anderson et al., Larsen and Massler et al. The modification proposed by the Examiner is not one that would have been well within the grasp of one of ordinary skill in the art at the time the invention was made. In this regard, the Examiner has failed to establish that the teachings of Larsen and Massler et al. could be applied with a reasonable likelihood of success to Anderson et al. There is no evidence to suggest that this is a situation where the ordinary artisan could have

combined the teachings in a manner that would result in the invention of claim 12 and there is no evidence to suggest the artisan would have seen the benefit in doing so. Furthermore, Applicant has unexpectedly found that the invention set forth in claim 12 reduces contamination of the backside of a substrate and increases substrate yields. Thus, claim 12 is allowable over the references cited.

Applicant requests withdrawal of the rejection of claim 12 under 35 U.S.C. §103(a). In addition, Applicant requests withdrawal of the rejection of claims 14, 15 and 19 which depend from claim 12 and are not rendered unpatentable by Anderson et al., Larsen and Massler et al. for at least the same reasons as claim 12.

Anderson et al., Larsen and Massler et al. also do not render independent claim 58 unpatentable. Claim 58 is to a substrate support comprising, inter alia, a contact surface comprising a plurality of mesas, each mesa substantially entirely composed of (i) a surface coating comprising a diamond-like carbon material comprising a composition of from about 50 atom % to about 90 atom % carbon, from about 5 atom % to about 10 atom% hydrogen, from about 10 atom % to about 20 atom % silicon, and from about 5 atom % to about 10 atom % oxygen, to provide a coefficient of friction of less than about 0.3, an average surface roughness of less than about 0.4 micrometers, and a microhardness of at least about 8 GPa, and (ii) an adhesion layer comprising a metal layer between the ceramic support structure and the surface coating.

One of ordinary skill in the art would not have found it obvious to modify Anderson et al. in view of the teachings of Larsen and Massler et al. in a manner that would arrive at the invention of claim 58, as discussed above. Specially, Anderson et al., Larsen and Massler et al. do not teach a substrate support comprising a contact surface comprising mesas that are substantially entirely composed of a surface coating comprising a diamond-like carbon material and an adhesion layer comprising a metal layer between the ceramic support structure and the surface coating.

Accordingly, Applicant requests withdrawal of the rejection of claim 58 under 35 U.S.C. §103(a).

II. The Examiner rejected claims 5, 6, 16, 18, 20 and 61-63 under 35 USC §103(a) as being unpatentable over Anderson et al. in view of Massler et al. and further in view of Dorfman et al. (U.S. Patent 5,352,493). The rejection is traversed.

Claims 5, 6, 16, 18, 20 and 61-63 depend from one of independent claims 12 and 58. Anderson et al. and Massler et al. do not render claims 12 and 58 unpatentable for the reasons discussed above. Dorfman et al. is not relied upon to make up for the deficiencies of Anderson et al. and Massler et al., nor does it. Thus, independent claims 12 and 58 are allowable over the combination of Anderson et al., Massler et al., and Dorfman et al. and the claims depending therefrom are also allowable over the combination of references for at least the same reasons as the claim from which they depend.

Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

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Date: March 1, 2010

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